

What is claimed is:

1. A hybrid loop comprising:
 - a. an evaporator component having:
 - i. an exterior surface exposed to a heat source;
 - ii. an interior cavity having a porous wick, one or more liquid arteries encased inside the porous wick, and a vapor space, wherein the porous wick extracts liquid from the liquid arteries by capillary action as needed to sustain the evaporation of the liquid working fluid from the porous wick, and the capillary forces in the porous wick are sufficient to separate the vapor phase working fluid inside the vapor space and the liquid phase working fluid inside the liquid artery;
 - iii. an inlet for admitting the liquid phase working fluid into the liquid arteries;
 - iv. a first outlet for exit of the vapor phase working fluid from the vapor space; and
 - v. a second outlet for exit of excess liquid phase working fluid from the porous wick;
 - b. a condenser component having:
 - i. an exterior surface exposed to a heat sink at a lower temperature than the said heat source;
 - ii. an interior space in which the vapor phase working fluid from the said evaporator component condenses into liquid phase;
 - iii. an inlet for admitting the vapor phase working fluid; and
 - iv. an outlet for exit of the condensed liquid phase working fluid;
 - c. a liquid reservoir having:
 - i. an interior space for storing the liquid phase working fluid;
 - ii. a first inlet for admitting the condensed liquid phase working fluid;
 - iii. a second inlet for admitting the excess liquid phase working fluid; and
 - iv. an outlet for exit of the liquid phase working fluid;
 - d. a liquid pump having:
 - i. an inlet for admitting the liquid phase working fluid;
 - ii. an outlet for discharging the liquid phase working fluid at an elevated pressure;

- iii. wherein the liquid pump draws liquid phase working fluid from the liquid reservoir into the liquid arteries in the evaporator;
- iv. wherein the liquid phase working fluid drawn by the liquid pump into the said liquid arteries is in excess of the requirements of evaporation in the evaporator; and
- v. wherein the excess liquid phase working fluid in the liquid arteries is further driven by the liquid pump into the liquid reservoir;
- e. a vapor transport line connecting the first outlet of the evaporator and the inlet of the condenser;
- f. a liquid transport line connecting the outlet of the condenser and the first inlet of the liquid reservoir;
- g. a first liquid supply line connecting the outlet of the liquid reservoir and the inlet of the liquid pump;
- h. a second liquid supply line connecting the outlet of the liquid pump and the inlet of the evaporator.
- i. an excess liquid return line connecting the second outlet of the evaporator and the second inlet of the liquid reservoir; and

2. The hybrid loop of claim 1 in which the porous wick in the evaporator is formed of bonded powder.

3. The hybrid loop of claim 2 wherein the bonded powder is formed from at least one of metal, ceramic, glass and plastic powders.

4. The hybrid loop of claim 2 wherein the bonded powder has a grooved shape.

5. The hybrid loop of claim 4 wherein the porous wick has liquid arteries encased in peak regions of porous lands.

6. The hybrid loop of claim 4 wherein the porous wick has different dimensions at different locations.

7. The hybrid loop of claim 2 wherein the bonded powder includes regions of relatively coarse bonded powders and regions of relatively fine bonded powders.

8. The hybrid loop of claim 1 in which the porous wick in the evaporator comprises at least one mesh screen.

9. The hybrid loop of claim 8 wherein the mesh screens have one or more layers.
10. The hybrid loop of claim 9 comprising a plurality of mesh screens wherein the mesh screens have different pore sizes between the layers and at different locations of each layer.
11. The hybrid loop of claim 1 in which the porous wick in the evaporator is formed of micro or nano wires.
12. The hybrid loop of claim 11 in which the micro or nano wires are bonded to the surface of the evaporator.
13. The hybrid loop of claim 11 in which the said micro or nano wires are plated to the surface of the evaporator.
14. The hybrid loop of claim 1 in which the porous wick comprises any combination of the bonded powder, mesh screen and longitudinal grooves in the wall of the said evaporator.
15. The hybrid loop of claim 1 wherein the liquid artery has a porous wall with capillary properties, permitting the liquid phase working fluid to be drawn into the porous wick by capillary action in the porous wick while preventing the vapor from penetrating into the liquid artery.
16. The hybrid loop of claim 15 wherein the porous wall of the liquid artery is made of one or more slot openings in the wall of the liquid artery.
17. The hybrid loop of claim 15 wherein the porous wall of the liquid artery is a micro or nano porous material.
18. The hybrid loop of claim 17 wherein the micro or nano porous material is one of sintered powders, brazed powders, pressed powders, glued powders, and mesh screen.
19. The hybrid loop of claim 15 in which the porous wall of the liquid artery has a distribution of pore sizes.

20. The hybrid loop of claim 1 wherein the liquid artery is in contact with the porous wick.
21. The hybrid loop of claim 1 wherein the liquid artery is partially encased by the porous wick.
22. The hybrid loop of claim 1 wherein the liquid artery is fully encased by the porous wick.
23. The hybrid loop of claim 1 wherein the liquid artery consists of multiple, parallel branches.
24. The hybrid loop of claim 23 wherein the multiple, parallel branches are connected to a common liquid manifold at each end.
25. The hybrid loop of claim 23 wherein the multiple, parallel branches are connected to each other into a serpentine configuration.
26. The hybrid loop of claim 1 wherein the liquid pump is located in the liquid reservoir.
27. The hybrid loop of claim 1 wherein the liquid reservoir and liquid pump are integrated with the evaporator.
28. The hybrid loop of claim 1 wherein the liquid supply line and the liquid artery form a co-axial bayonet.
29. The hybrid loop of claim 28 wherein the liquid supply line is inside the liquid artery.
30. The hybrid loop of claim 29 wherein a space between the exterior of the liquid supply line and the interior of the liquid artery forms the excess liquid return line.
31. The hybrid loop of claim 1 wherein the first and second liquid supply lines are combined into one liquid supply line connecting the outlet of the liquid reservoir and the inlet of the evaporator.
32. The hybrid loop of claim 31 wherein the excess liquid return line is divided into first and second excess liquid return lines.

33. The hybrid loop of claim 32 wherein the first excess liquid return line connects the second outlet of the evaporator and the inlet of the liquid pump.
34. The hybrid loop of claim 32 wherein the second excess liquid return line connects the outlet of the liquid pump and the second inlet of the liquid reservoir.
35. The hybrid loop of claim 1 wherein the evaporator consists of multiple, discrete sub evaporators.
36. The hybrid loop of claim 35 wherein a single liquid line supplies the arteries in the multiple sub evaporators.
37. The hybrid loop of claim 35 wherein multiple liquid lines supply the arteries in the multiple sub evaporators.
38. The hybrid loop of claim 35 wherein the vapor spaces in the multiple sub evaporators communicate with each other through vapor lines.
39. The hybrid loop of claim 1 wherein the liquid pump consists of multiple liquid pumps.
40. The hybrid loop of claim 1 wherein the liquid artery has changing cross-sectional dimensions along its length.
41. The hybrid loop of claim 1 wherein the liquid supply line and excess liquid return line has valves for flow control.